TFT-LCD
Manufacturing Process
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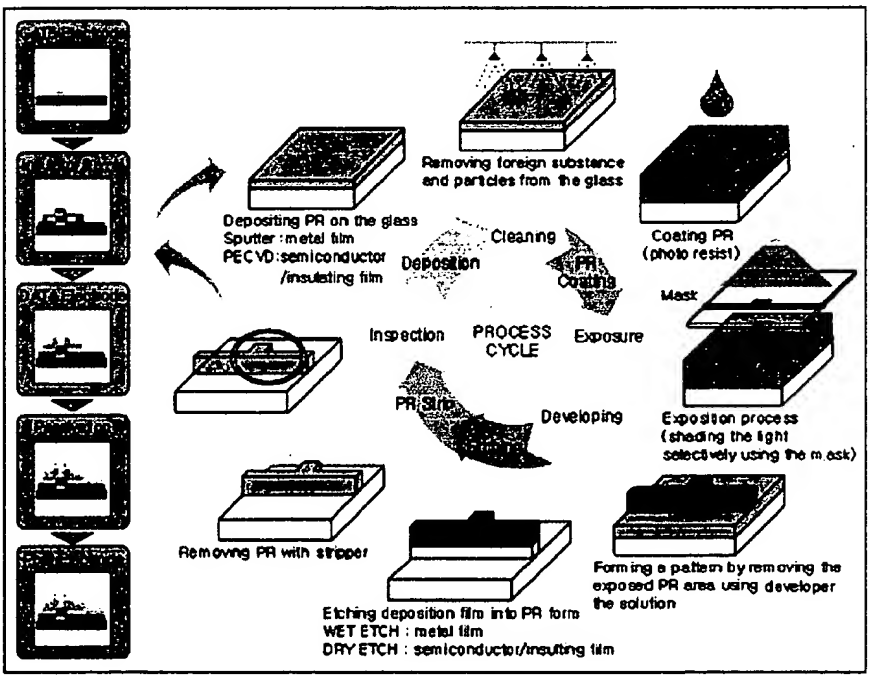
TFT Process Cell Process Module Process

The TFT-LCD process is divided into the TFT process, the cell process and the module process.

TFT Process



process and processing steps are quite similar to that of the semiconductor industry. Deposition, photolithography and etching steps are common to both industries. The key differences are that the TFT is built on a glass substrate instead of a silicon wafer. In addition, the TFT requires a processing temperature ranging from approximately 300 to 500iÉ, compared to about 1,000iÉ required for semiconductor fabrication..

1. PECVD (Plasma Enhanced Chemical Vapor Deposition) Process

Before getting the gas source into the chamber, inside it the state of vacuum is maintained and the glass plate is heated to a specific temperature. When the source gas flows into the chamber, RF voltage is applied from electrodes inside the chamber to transform the gas into a plasma state. From this plasma, precursors are formed and deposited on the glass substrate. Parameters for deposition

are vacuum level, RF power, substrate temperature, reaction gases and reaction pressure.

The materials deposited by PECVD systems are classified as either insulators or semiconductor layers. Insulator films include gate-insulators, protection layers and etch-stoppers. Semiconductor films include "a-Si:H," which forms the active layer in the transistor, and "n+ a-Si:H," which reduces the contact resistance with metals.

2. Sputtering Process

Sputtering is the process wherein the gas ion, which is the high energy inside the plasma created by RF power or DC power, collides with the target surface--resulting in the deposition of the target material on the plate. Generally, the target materials are mounted on the negative electrode surface. Then, the sputtered target materials are deposited on the plate, which is put on the positive electrode. For sputtering, inactive gases are used, such as helium and argon, so that deposition material chemistry is not affected.

3. Photolithography Process

Photolithography is the transfer of a pattern from the photo mask onto a substrate. The photolithography process begins when the substrate is coated with an extremely thin liquid film of photosensitive material, called photoresis. The light then exposes the photoresist, some of which is destroyed when exposed to the light. The unnecessary portion of the material is then cleaned from the surface through another process, leaving an extremely fine pattern behind. Another layer of the photoresist is then deposited to the substrate, exposed, cleaned, and so on, until all the layers have been printed or imaged onto the surface.

The photolithography process is a critical step within the LCD manufacturing process because panel quality depends on the entire pattern formation. As such, it is extremely sensitive to particles and other forms of contamination. . Thus, this process requires a special clean environment, commonly referred to as a clean room, and precise control of r equipment, chemicals and materials. In the future, this will prove increasingly important as advanced displays that offer greater functionality and higher performance will require increasingly complex and stringent manufacturing capabilities.

4. Dry etch Process

The dry etch process uses reactive species, such as atoms or radicals from the gas plasma, to etch away a portion of the object material. When these species react with the material located on the plate, the open region of material transforms into a volatile state and is removed from the matrix. In this process, the reaction velocity is fast and fine patterns can be formed uniformly.